

FIG. 2A

MOTION (TRAJECTORY) INFORMATION	Symbol	OPERATION ON RAW DATA	Explanations
Time span	T	range	
Region	R	area, \cap	
Begin point	B	\subset	contained in
End point	E	\subset	contained in
Speed range	S	\cap, \subset, \supset	
Direction	V	\approx_θ	
Accel range	A	\cap, \subset, \supset	
Shape	H	$=$	
Path	P	$\Sigma, \approx_t, \approx_o$	union, time shifted, overlap

FIG. 2B

Motion patterns examples

Query based on operators
(α, β are user input/parameters)

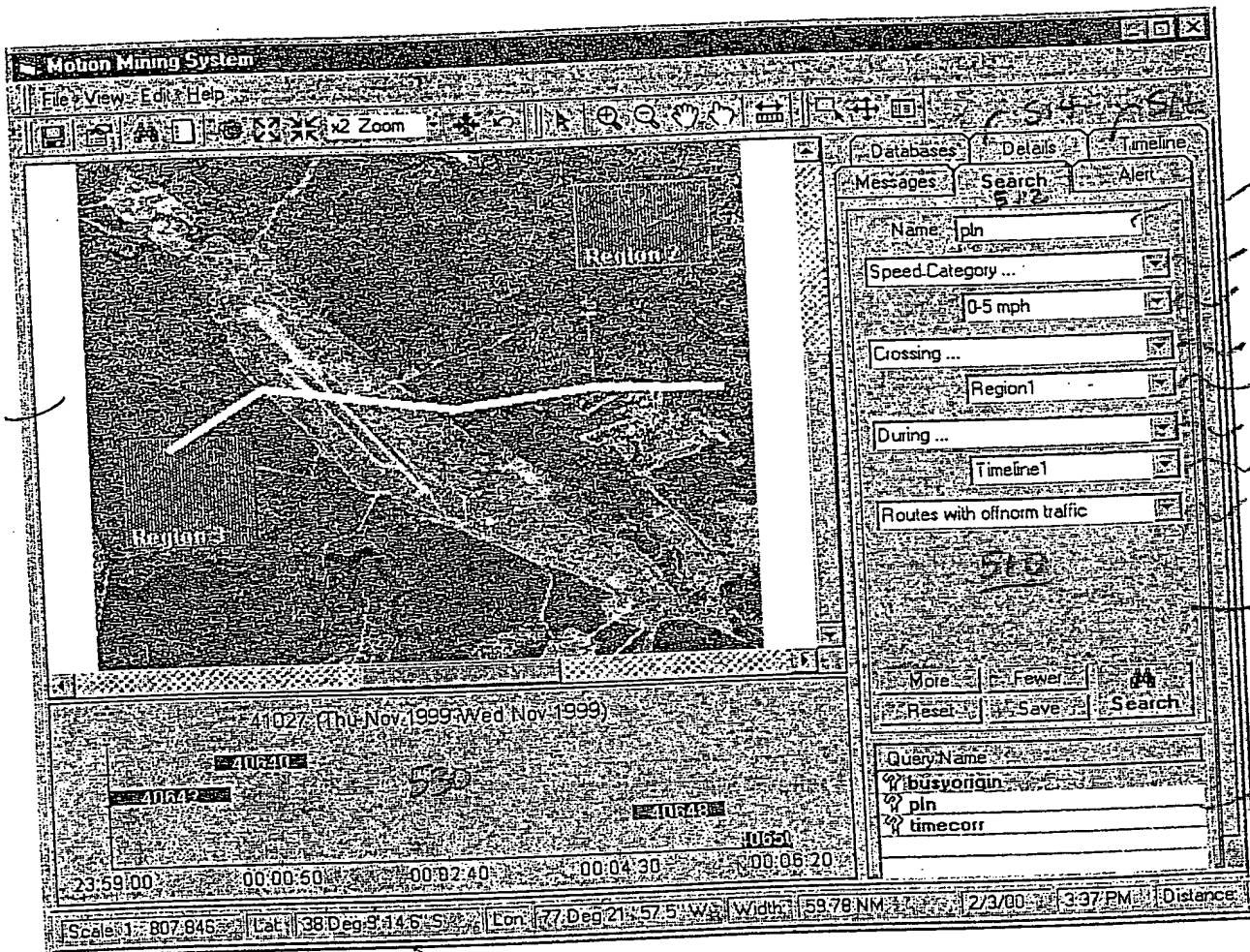
- Object stopping
- Object moving fast
- Active region
- Source region
- Beaten path
- Road
- Convoy
- Ran a traffic light
- Illegal parking

$\{J: J.A \cap [-\infty, 0) \text{ and } 0 \in J.S\}$
 $\{J: J.S \in [\alpha, \infty)\}$
 $R = \cap J_i.R$, where $\{|J_i|\} > \alpha$ and $R.area < \beta$
 $R = \cap J_i.B$, where $\{|J_i|\} > \alpha$ and $R.area < \beta$
 $P = \Sigma J_i.P$, where $\forall J_i, \{|J_k: J_k \approx_o J_i|\} > \alpha$
 beaten path with $\alpha=1$
 $\Gamma = \{J_i\}: \forall J_i \in \Gamma \exists J_k \in \Gamma$, where $J_i \approx_t J_k$ and $|\Gamma| \geq \alpha$
 deviation from
 traffic direction { }
 object stopped while object in front moves

FIG. 3

FIG 5

520



500

FIG 5

562

554

554C

556

556C

558

558C

560

550

552

The screenshot shows the 'Route Explorer' application interface. It features a compass rose on the left with directions N, NE, E, SE, S, SW, W, and NW. Below the compass is a 'Heading' dropdown menu. To the right of the compass is an 'Object Type' dropdown menu. The main area contains a large list of route categories, including 'Crossing', 'Within', 'Origin', 'Destination', 'Busiest origin regions', 'Busiest destination regions', 'Routes with offnorm traffic', 'Regions with offnorm inflow', and 'Regions with offnorm outflow'. To the right of this list are several smaller dropdown menus for 'Region', 'Interval', 'During', 'Before', 'After', 'Speed Category', 'Acceleration Category', and 'Type'. At the bottom right, there are two more dropdown menus for 'Speed' and 'Acceleration' with their respective ranges.

FIG. 6

Messages Search Alert
Databases Details Timeline

☒ Time Interval

Start Date: 11/14/99

Start Time: 12:00:00 AM

End Date: 11/14/99

End Time: 2:00:00 AM

Commit Cancel

Timeline1

November 1999

Sun	Mon	Tue	Wed	Thu	Fri	Sat
31	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	1	2	3	4
5	6	7	8	9	10	11

Today: 2/3/00

700

FIG. 7

Messages Search Alert
Databases Details Timeline

Accel: 12.1
Speed: 0.1

Group: 41027

Show All Trajectories

Trajectory	Start Time
<input type="checkbox"/> 40640	Thu Nov 11 00:00:10 1999
<input checked="" type="checkbox"/> 40642	Wed Nov 10 23:59:00 1999
<input type="checkbox"/> 40648	Thu Nov 11 00:04:40 1999
<input type="checkbox"/> 40650	Thu Nov 11 00:05:50 1999

800

FIG. 8

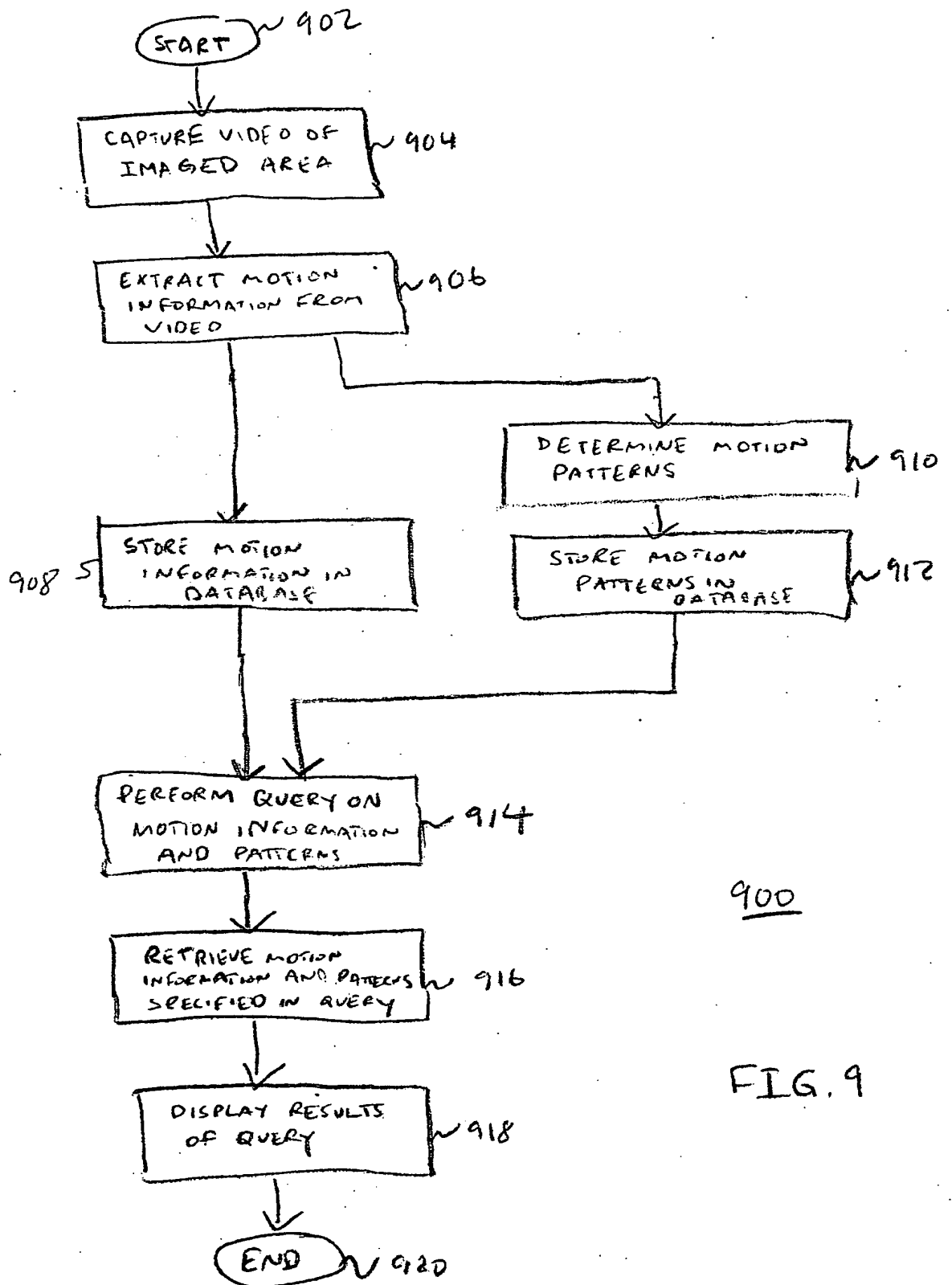


FIG. 10

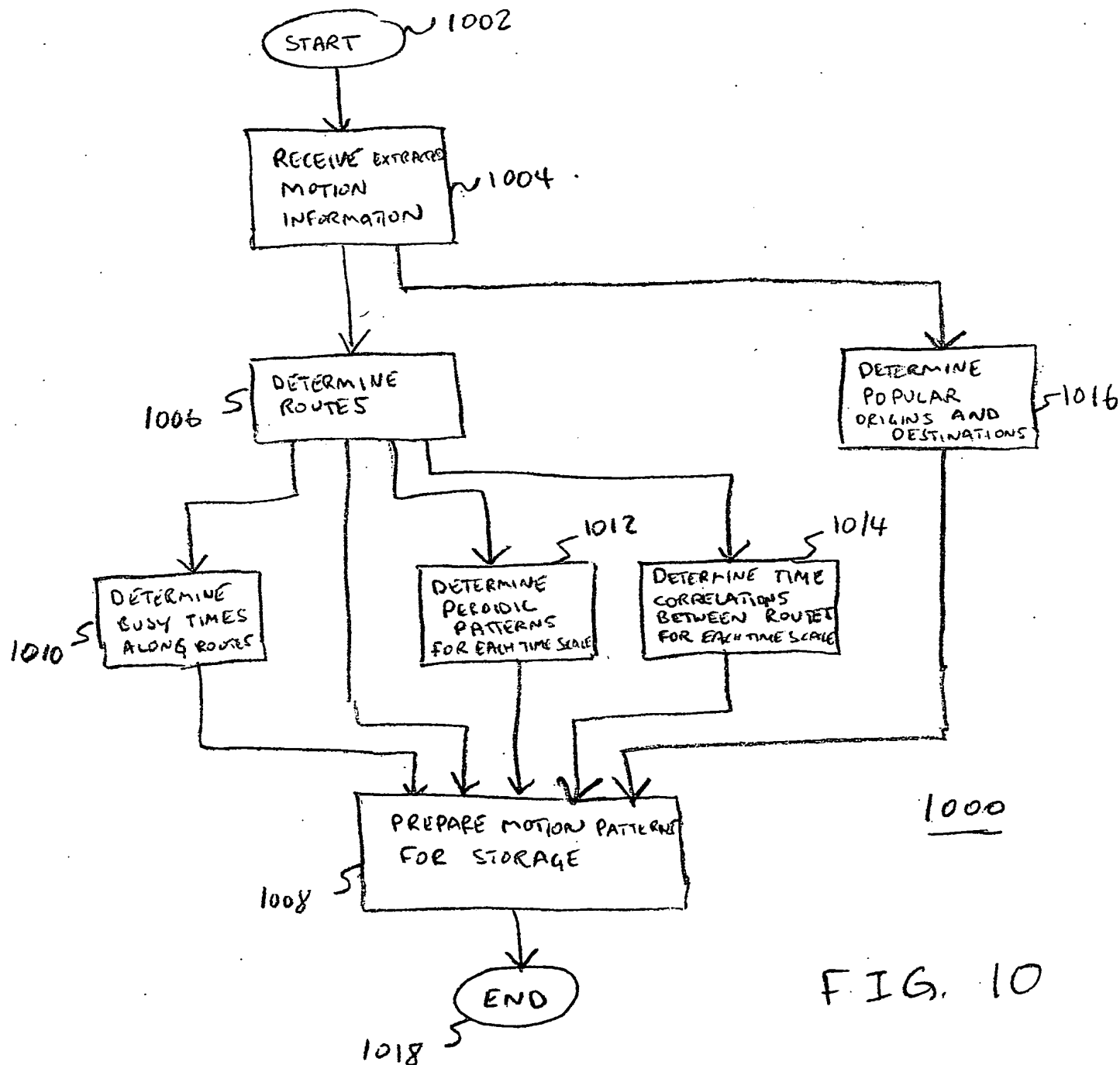


FIG. 10